

# Smart Car Parking Using Arduino Microcontroller

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**Abstract—** Smart car parking project aims at providing a confusion free and easy parking. This project helps the drivers of the cars to park their vehicles with minimum wastage of time with accurate information of the availability of the space to park over Android app. The operator also can collect parking fees efficiently and the drivers can book and pay for their parking space over Android app. It includes an Arduino Uno and Arduino Mega as the microcontroller unit to which the servo motors, LCD, object counter using IC 555 and IC 4026, ultrasonic sensors (HC-05) and IR sensors SR21-IC are interfaced. The LCD displays the availability of the space, the counter keeps the check of the number of cars entering and exiting the parking space, the servo motor helps as gate for the entry and exit of the cars. The ultrasonic sensors detect the availability of the parking space.

**Index Terms—** Arduino Uno, Arduino Mega, ultrasonic sensors, IR sensors.

## I. INTRODUCTION

Smart car parking is an automated, flexible, user friendly and highly efficient technology as the booking of parking slot for the driver's vehicle is made possible using an Android app. Also, the operator can easily keep the track of vehicles entering and exiting the parking space and parking fees collected.

### A. Construction and Working

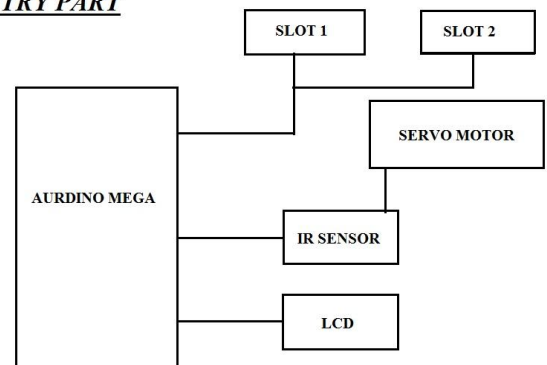
The construction and working of the project is divided into two parts:-

#### 1) Entry Part

The Entry Part of the project consists of Arduino Mega microcontroller to which a servo motor, IR sensor, LCD and ultrasonic sensor are interfaced. The servo motor acts as a gate at the entrance and it opens and closes when the IR sensor detects presence of car. The LCD displays the parking

slots which are empty for the car drivers. The ultrasonic sensors detect the presence and absence of car in each parking slot.

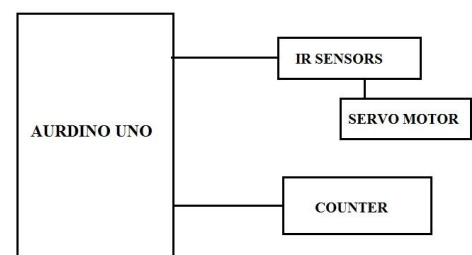
#### ENTRY PART



#### 2) Exit Part

The Exit Part of the project consists of Arduino Uno to which a servo motor, IR sensor and the object counter are interfaced. The servo motor acts as a gate at the entrance and it opens and closes when the IR sensor detects presence of car. The object counter circuit is designed using IC 555 and IC 4026 to count the number of cars exiting the parking space. This will help the operator to calculate the amount collected.

#### EXIT PART



## II. COMPONENTS

The components used in the project are:-

1. Arduino Mega
2. Arduino Uno
3. LCD Screen
4. Ultrasonic Sensor
5. IR Sensor
6. Servo Motor
7. Object Counter

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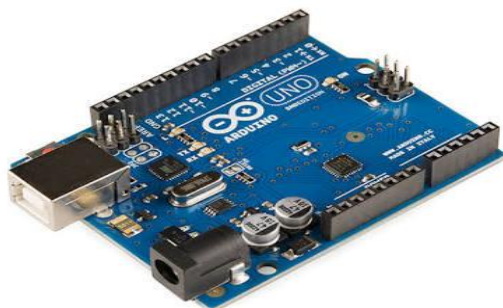
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## 1. ARDUINO MEGA



The Arduino Mega is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. [1]

## 2. ARDUINO UNO



Arduino Uno a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs). It also has 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It is the most widely used and user friendly microcontroller. Simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. [2]

## 3. LCD SCREEN



LCD screen is a flat-panel display, electronic visual display that uses the light-modulating properties of liquid crystals and the liquid crystals do not emit light directly. LCDs are available to display arbitrary images. It displays preset words, digits, and 7-segment displays. It has a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays. [3]

## 4. ULTRASONIC SENSOR



HC-SR04 is the ultrasonic ranging sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit. There are only four pins on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). [4]

## 5. IR SENSOR



An infrared sensor is an electronic device, which emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. Its operating voltage is 3V to 6V. Its operating range is 2cm to 30cm with an operating angle of 35°.

## 6. SERVO MOTOR

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. Servo can rotate approximately 180°. It has an operating voltage of 5V and operating speed of

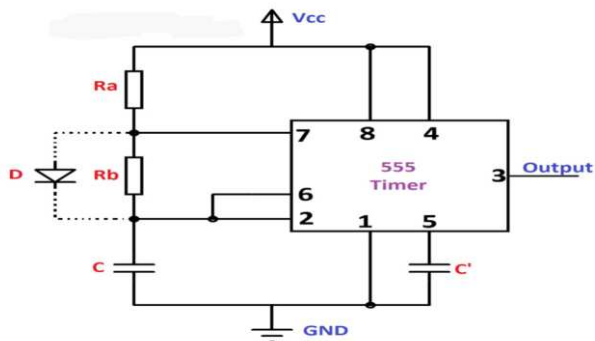
0.12sec/60o with torque of 1.8 Kg-cm. [5]



## 7. OBJECT COUNTER

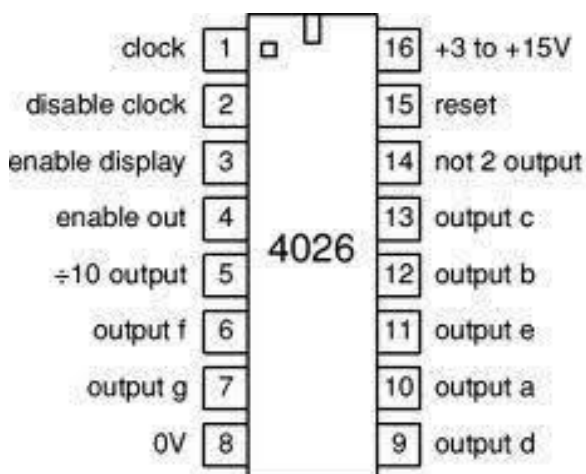
The object counter is made up of two ICs:-

a) IC 555 in Astable Mode



IC 555 in Astable Mode is used to generate clock pulses which will drive the IC CD 4026. IC 555 in astable mode is also called as free running oscillator. In astable mode, 555 timer is very simple, easy to design, low cost and very stable.

b) IC CD 4026

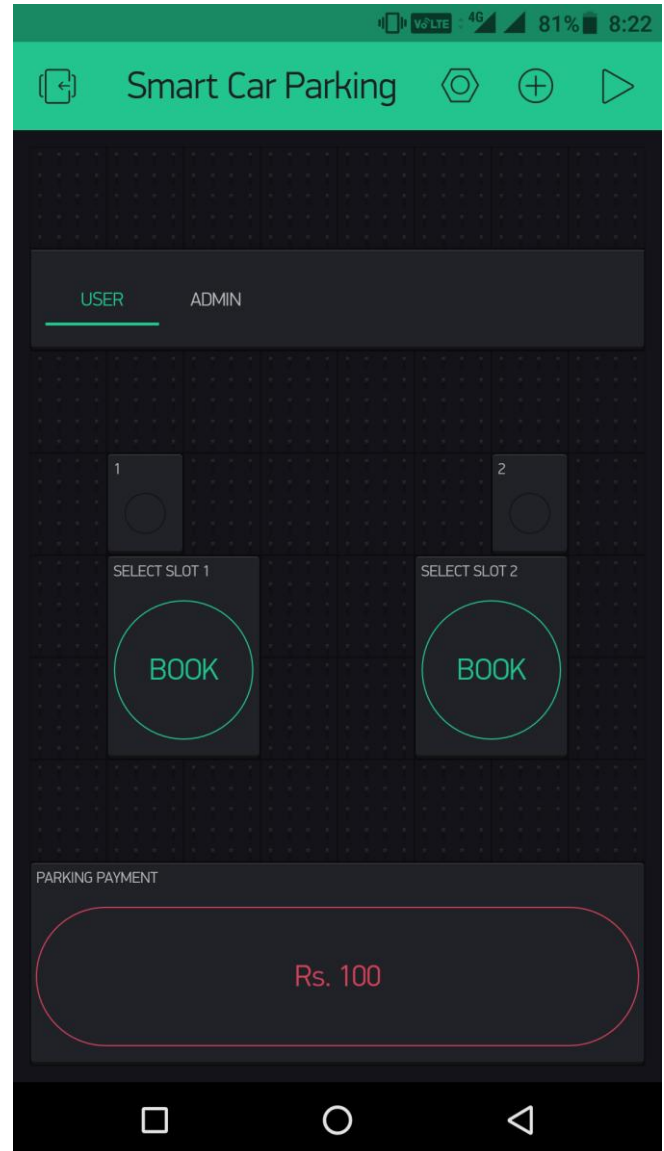


IC CD 4026 is a CMOS decade counter with inbuilt decoder to display on seven segment display. It counts from 0-9 and displays the numbers on the seven segment display. It increments the number on arrival of next clock pulse from IC 555.

## III. MOBILE APP

The mobile app is divided into two sections:-

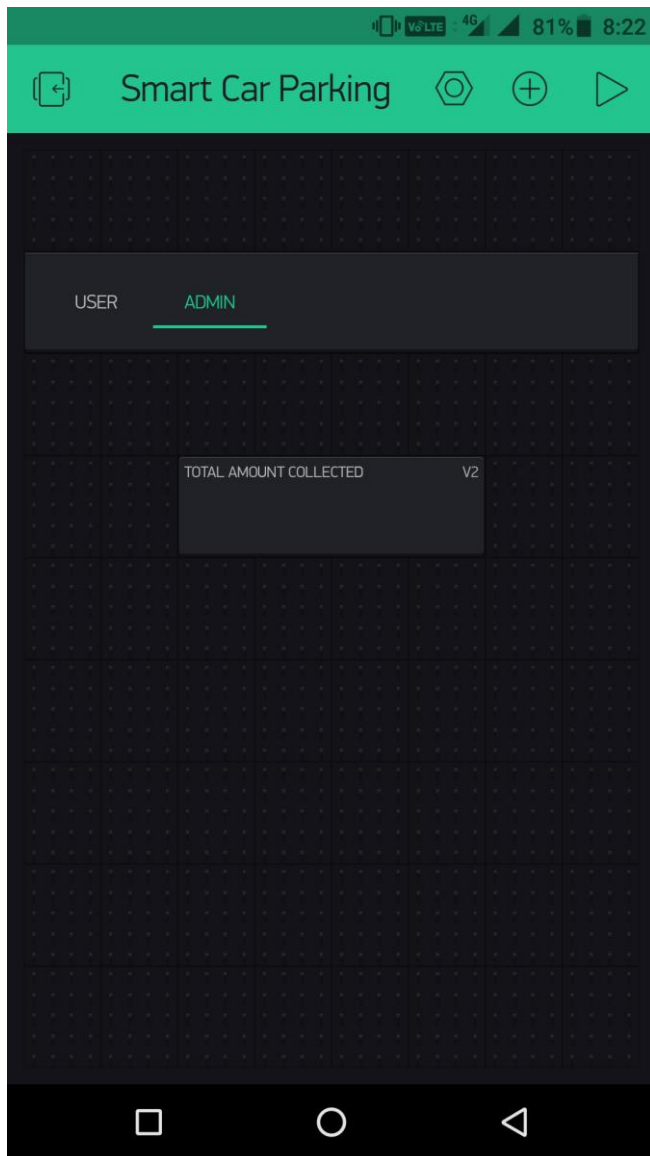
A. Users



This section of the mobile app can be accessed by the users. The users are the drivers who want to book a parking slot for their cars. After payment, the parking slot is booked and reserved for the driver.

B. Administrator

This section can be accessed by the administrator. The admin can redeem the amount of payment collected through the app. Also, the admin can recheck the total amount collected with the total number of cars entered into the parking area.



## REFERENCES

- [1] <https://www.arduino.cc/en/Main/ArduinoBoardMega>
- [2] <https://store.arduino.cc/arduino-uno-rev3>
- [3] <https://www.engineersgarage.com/electronic-components/16x2-lcd-module-datasheet>
- [4] <http://www.micropik.com/PDF/HCSR04.pdf>
- [5] <https://sticktech.wordpress.com/2012/01/16/servo-motor-basics/>

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## IV. ADVANTAGES

Smart Car Parking system is easier, efficient and less time consuming as it uses an Android app to book the nearest parking slot and also helps in tracking the number of cars entered in the parking area and the amount of payment collected which reduces human efforts. The system provides high performance in tracking the car entering and exiting from the parking area and also its presence in a parking slot.

## V. DISADVANTAGES

The system requires high maintenance as each sensor must work properly to provide efficiency in working. High power dissipation is recorded through each sensor.

## VI. RESULTS AND CONCLUSION

Smart Car Parking aims to provide efficient way of parking for drivers without any hesitation. The Android app is flexible to be used by both users and administrator. The cars entering and exiting the parking slots can be tracked with minimum errors. The amount of parking payment can be redeemed by the administrator efficiently.